

THE IMPACT OF RESIDENTIAL SOLID FUEL PROPERTIES ON ELEMENTAL AND ORGANIC CARBON EMISSIONS

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Residential solid fuel combustion is known to be a major contributor to ambient air pollution in many areas of the world. The type of fuel used is largely dependent on geographical location, with certain areas having a preference for biomass- or wood-based fuels; and others having a preference for coal-based fuels. The soot formation mechanisms are very different for the two fuel types, resulting in different emissions factors for EC and OC, as well as a difference in the chemical composition of the soot.

A number of fuels available for the domestic market were chosen for analysis, including bituminous coal, manufactured smokeless fuels, peat, hardwoods, softwoods, torrefied woods and coal-biomass blends. The fuels were combusted in a 6 kW multi-fuel stove and soot samples were collected on filters at regular intervals throughout each test. The EC and OC content of the soots were then determined by thermogravimetric analysis. The composition of the organic fraction was determined by pyrolysis-GC/MS. It was found that the ratio of EC/TC is highly dependant on the timing of sampling, but were generally higher for the mineral fuels. The organic fraction of the wood soot was found to be dominated by aromatic compounds and sugars including levoglucosan, a common tracer used in attribution studies. Aromatics and phenols were also found in the coal soot, but the presence of alkane species was also noted.